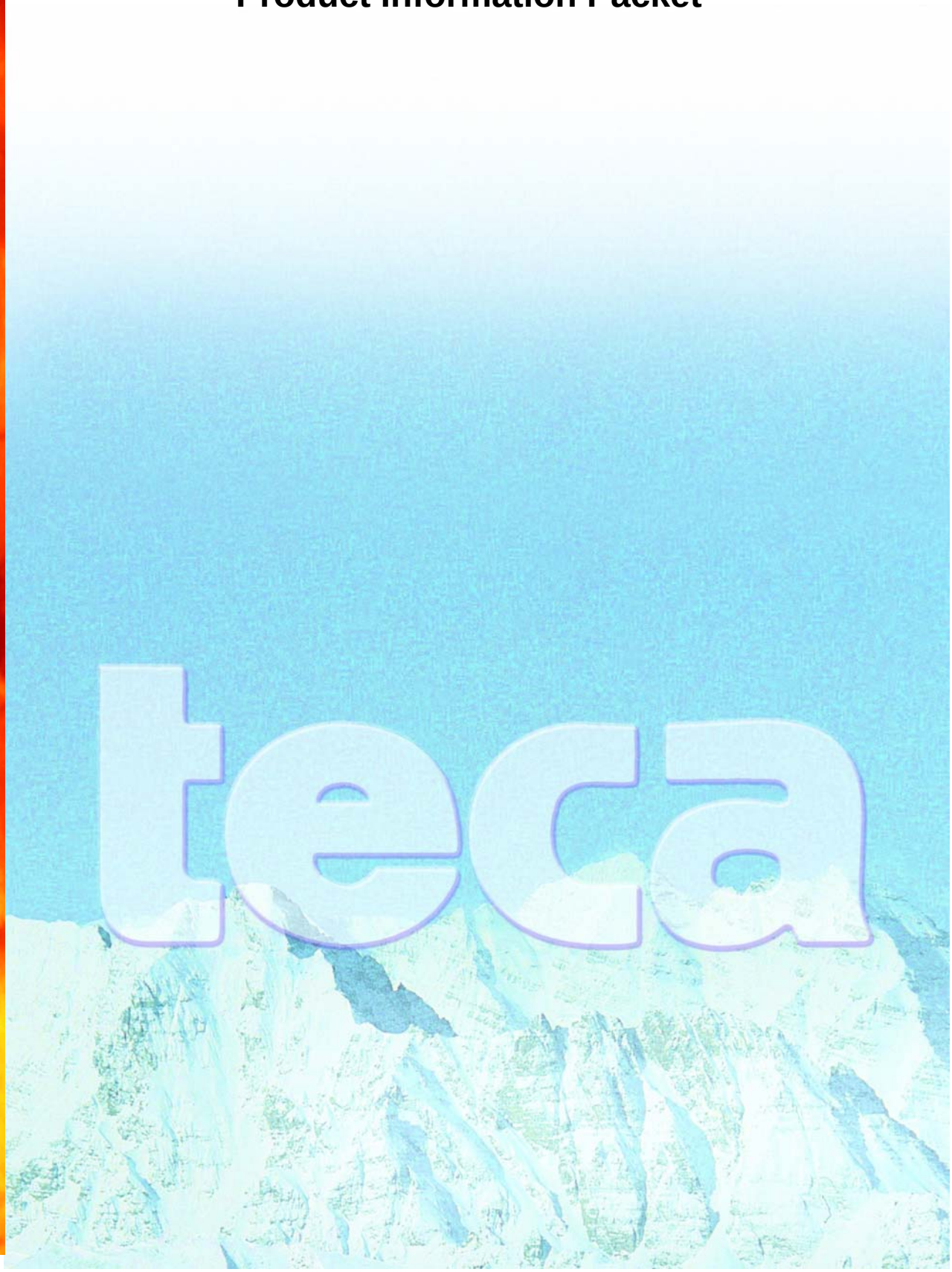
TC-3400 Temperature Controller

Product Information Packet



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1 INTRODUCTION

The TC-3400 is a 1/32 DIN size digital, microprocessor based temperature controller designed to be used in conjunction with TECA products.
All models are designed with Nema-4X IP56 front panel for corrosion and water resistance. This is ideal for applications such as food processing where equipment needs to be cleaned frequently. Features such as auto-tuning, dual output, and single input are available from these controllers. Each unit comes with factory default programming, but can be user modified through a setup menu.

2 SPECIFICATIONS

2.1 Features and Benefits

Advanced PID control algorithm
• Offers TRU-TUNE™+ adaptive control to provide tighter control for demanding applications
• Provides auto-tune for fast, efficient start up

Configuration communications with software
• Saves time and improves reliability of controller setup

Factory Mutual (FM) approved over/under limit with auxiliary outputs
• Increases user and equipment safety for over/under temperature conditions

Memory for saving and restoring parameter settings
• Reduces service calls and down time

Agency approvals: UL® listed, CSA, CE, RoHS, W.E.E.E. FM, SEMI F47-0200, Class I div. 2 rating on selected models
• Assures prompt product acceptance
• Reduces end product documentation costs

P3T armor sealing system
• Complies to NEMA 4X, IP66
• Allows controller to be cleaned and washed down
• UL® 50 independent certification to NEMA 4X specification

Touch-safe package
• Increases safety for installer/operator
• Complies to IP2X requirements

Consistent Termination Labeling (CTL) connection system
• Allows removable cage clamp connectors
• Provides consistent termination labeling

EZ-KEY
• Enables simple, one-touch operation of user defined, repetitive activities

Programmable menu system
• Reduces setup time and increases operator efficiency

Serial communication capabilities
• Provides a wide range of protocol choices including Modbus® RTU, EtherNet/IP™, Modbus® TCP, and DeviceNet™
• Supports network connectivity to a PC or PLC

2.2 Part Numbers

34 - X X X - X X - X X X

Input Voltage

0	Universal AC - 85 to 264 VAC, 47 to 63 Hz
4	12/24 VDC - 12 to 40 VDC, 20 to 28 VAC

Functions

2	Heat/Cool -No relay
3	Cool only, with relays
4	Heat/Cool, with relays

Switching Volts & Amps

A	None, drive signal only - no relays
B	Cool only, VAC switching, 120/240Vac, 10 Amps
C	Cool Only, VDC switching, 0-100 VDC, 12 Amps
D	Cool Only, VDC switching, 0-100 VDC, 20 Amps
E	Cool Only, VDC switching, 0-100 VDC, 40 Amps
F	Heat/Cool, VDC switching, 0-100 VDC, 12 Amps
G	Heat/Cool, VDC switching, 0-100 VDC, 20 Amps
H	Heat/Cool, VDC switching, 0-100 VDC, 40 Amps
I	Heat/Cool, Heat: 120/240 VAC, 10 amps Cool: VDC switching, 0-100 VDC, 12 Amps
J	Heat/Cool, Heat: 120/240 VAC, 10 amps Cool: VDC switching, 0-100 VDC, 20 Amps
K	Heat/Cool, Heat: 120/240 VAC, 10 amps Cool: VDC switching, 0-100 VDC, 40 Amps
L	Heat/Cool, Heat: 0-100 VDC, 12 Amps Cool: VAC switching, 120/240 VAC, 10 amps
M	Heat/Cool, Heat: 0-100 VDC, 20 Amps Cool: VAC switching, 120/240 VAC, 10 amps
N	Heat/Cool, Heat: 0-100 VDC, 40 Amps Cool: VAC switching, 120/240 VAC, 10 amps
O	Heat/Cool, Reverse Polarity, 0-100 VDC, 12 Amps
P	Heat/Cool, Reverse Polarity, 0-100 VDC, 20 Amps
Q	Heat/Cool, Reverse Polarity, 0-100 VDC, 40 Amps
R	Heat/Cool, VAC switching, 120/240 VAC, 10 amps

Sensor

0	None
1	3- Wire RTD - RTD-Probe
2	T type thermocouple (ring mount)

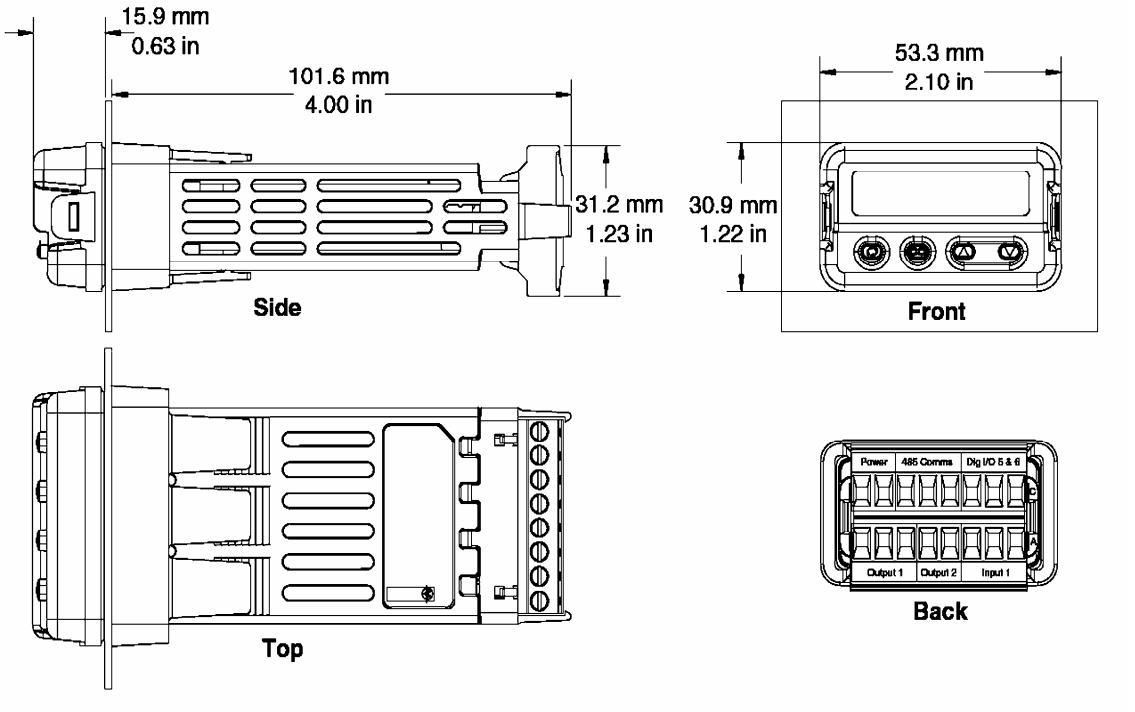
Communications

0	Basic communications
1	RS-232 external option, same as 2 with addition of RS-232/RS-485 converter
2	RS-485 internal option, full feature communication

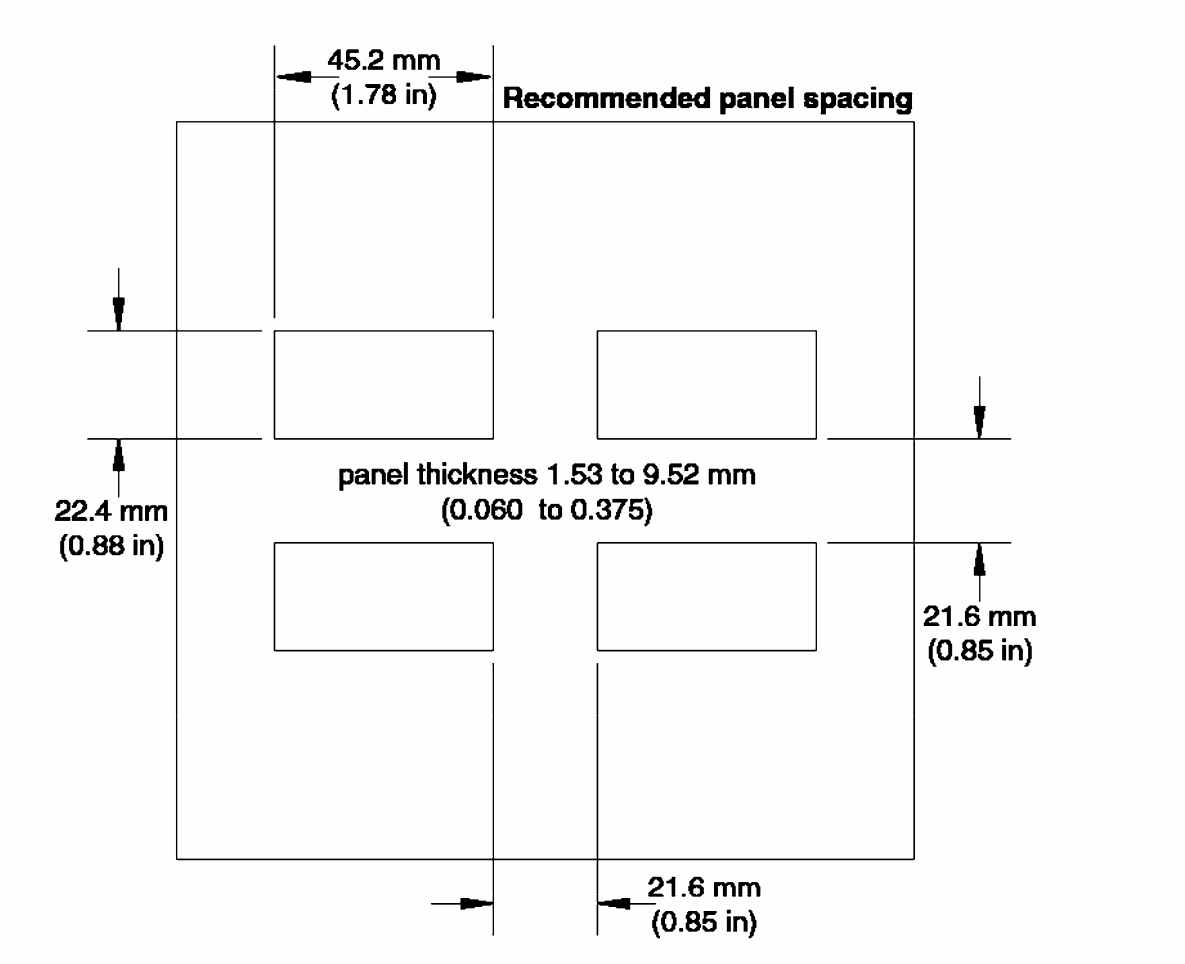
Custom Features

3 DIMENSIONS, PANEL CUTOUT AND MOUNTING

3.1 Dimensions



3.2 Panel Cutout



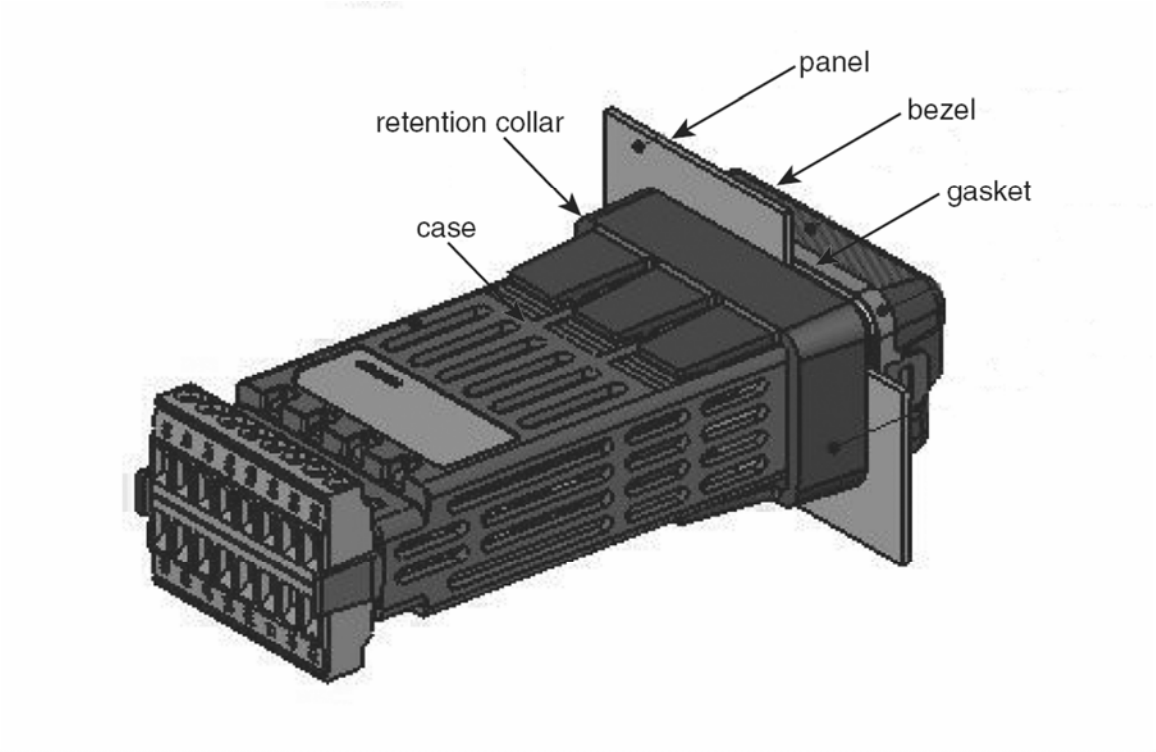
3.3 Mounting

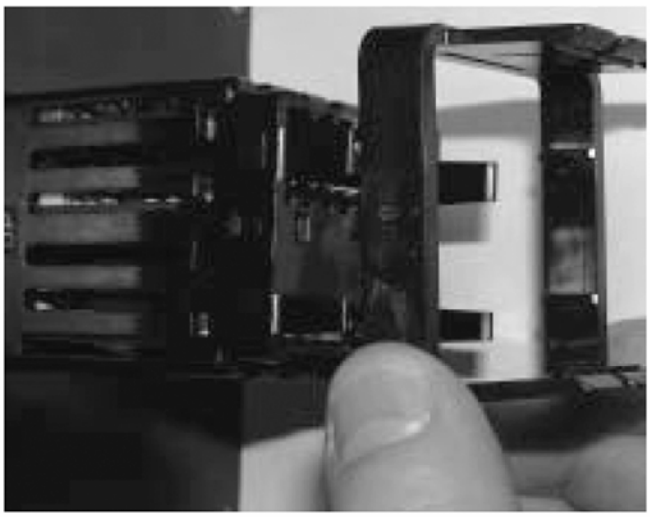
The TC-3400 Controller is designed to be mounted in a 1/32 DIN panel cutout. The TC-3400 sleeve mounted with it's front bezel assembly rated NEMA4/IP66 provided that:

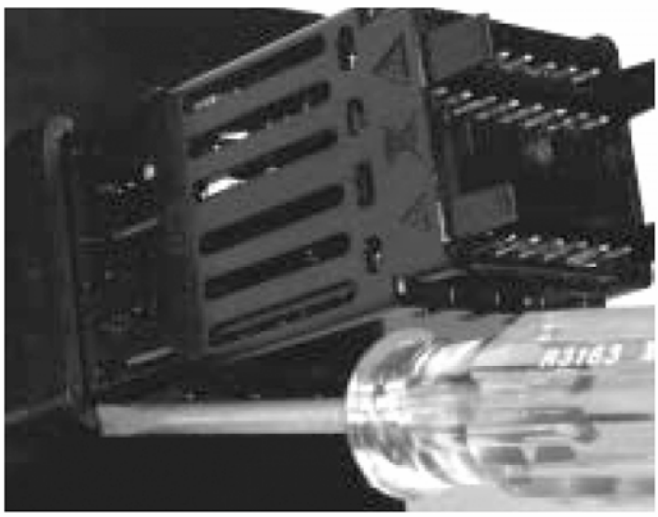
- the panel is smooth and the panel cutout is accurate
- the mounting instructions are carefully followed

To mount the controller proceed as follows:

1. Make the panel cutout using mounting cutout dimension in previous page.
2. Insert the case assembly into the panel cutout.
3. While pressing the case assembly firmly against the panel, slide the mounting collar over the neck of the controller.
4. For NEMA-4X seal, place the blade of a screwdriver in the notch of the mounting collar assembly and push toward the panel while applying pressure to the face of the controller. Don't be afraid to apply enough pressure to properly install the controller. The seal system is compressed more by mating the mounting collar tighter to the front panel. If you can move the case assembly back and forth in the cutout, you do not have a proper seal.







4 ELECTRICAL INSTALLATION AND SENSORS

4.1 Electrical Installation

Please refer to the appropriate wiring diagram included with the product package.

Use National Electric (NEC) or other country-specific standard wiring and safety practices when wiring and connecting this controller to a power source and to electrical sensors or peripheral devices. Failure to do so may result in damage to equipment and property, and/or injury or loss of life.

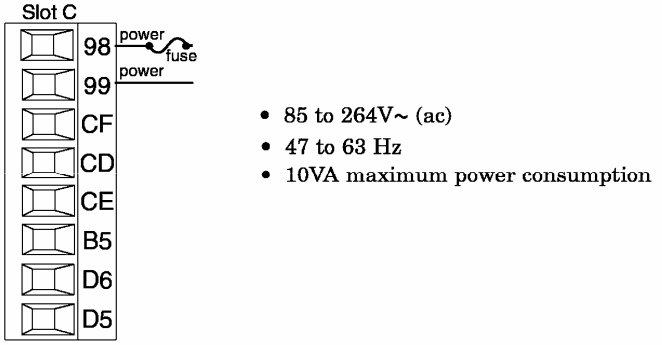
Maximum wire size termination and torque rating:

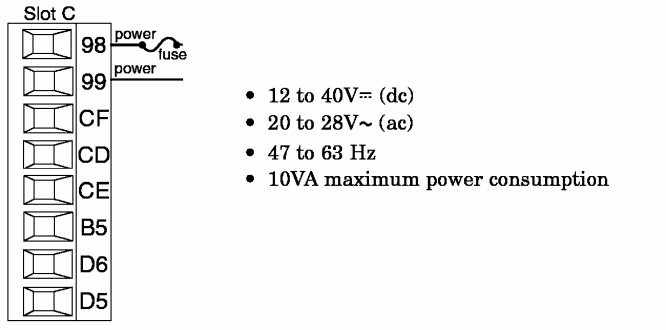
- 0.0507 to 3.30 mm^2 (30 to 12 AWG) single-wire termination or two 1.31 mm^2 (16 AWG)
- 0.8 Nm (7.0 in-lb.) torque

Adjacent terminals may be labeled differently, depending on the controller configuration.

The TC-3400 is designed for use with the following supply voltages:

- 85 - 240VAC, 47- 63 Hz, 10 VA maximum power consumption
- 12 to 40 VDC or 20 to 28 VAC, 47 - 63 Hz, 10 VA maximum power consumption

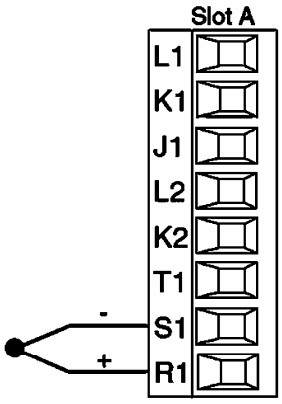




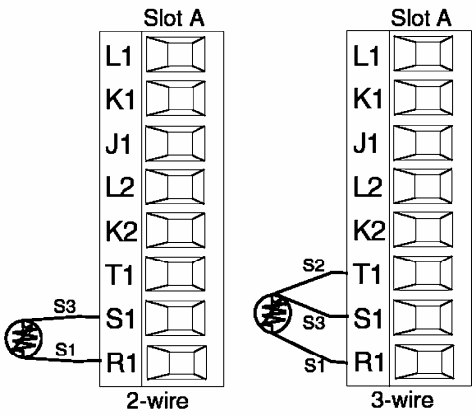
4.2 Sensors

There are two types of sensors available for order with TC-3400.
The diagrams below show the sensors connection to TC-3400, note how the three wire RTD is connected to TC-3400.

Thermocouple



RTD



5 PROGRAMS

A program is a set of parameters such as Proportional Band, Derivative Time and Approach, Cycle Time, etc…. that govern how the TC-3400 controls the process temperature and reacts to change in variables such as ambient temperature, increase/decrease of load.
The TC-3400 controller comes with a factory set program for general applications. There are two other canned programs available on the TC-3400 CD located in "***canned programs***" folder.

5.1 M – Precise PID control.wfc Program

This is the program which the TC-3400 is factory programmed with (there may be exceptions). This program is suitable for general cooling and heating applications, it is a tunable PID (Proportional Integral Derivative) program capable of providing precise and tight control.

5.2 N – Enclosure cool 35-heat 15.wfc Program

For applications where precise control is not a concern and where a cooling and heating unit is needed to keep the process temperature within a large temperature margin this application could be used. For the cool mode the program turns the cooling circuit on when the temperature rises to 35°C and turns the cooling circuit off when the temperature drops to 32°C (cool Hysteresis is set to 3.0°C). The heat circuit turned on when the temperature drops to 10°C and turned off when the temperature rises to 13°C (heat Hysteresis is set to 3.0°C). The set point is set to 22.5°C and both cool and the unit is idle between the two modes (the dead band is set to 9.5°C).

5.3 O – Enclosure cool hysteresis 3.wfc Program

For cool only applications where precise control is not a concern and where a cooling unit is needed to keep the process temperature within acceptable range this application could be used. The set point is set to 10°C and the dead band is set to 0°C cool circuit turns on when the temperature rises to 13°C and turns off when the temperature drops to 10°C (Hysteresis is set to 3.0°C).

Figure 5.2

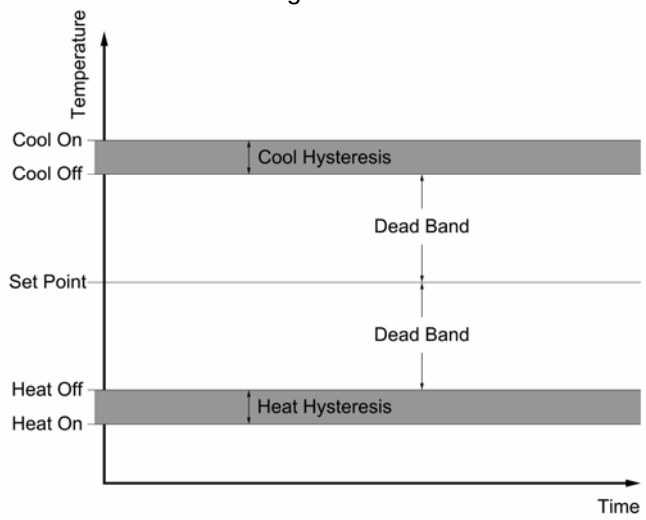
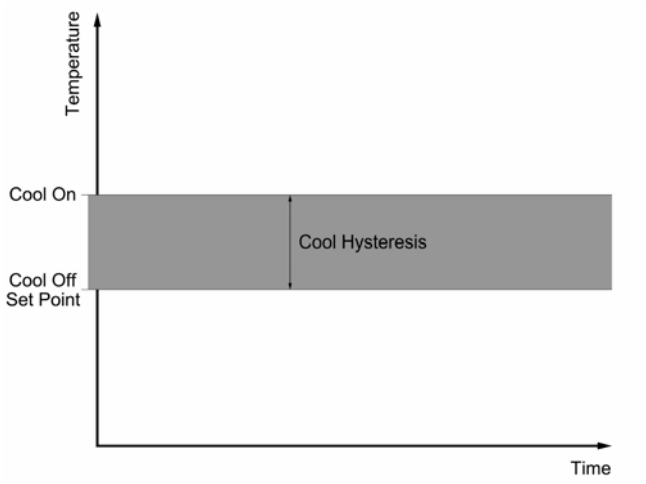


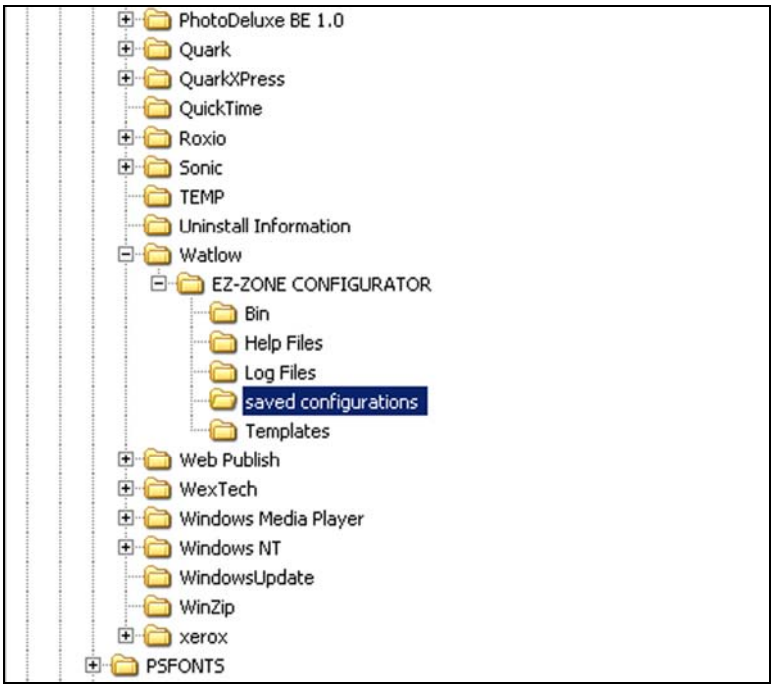
Figure 5.3



5.4 Viewing And Editing Programs

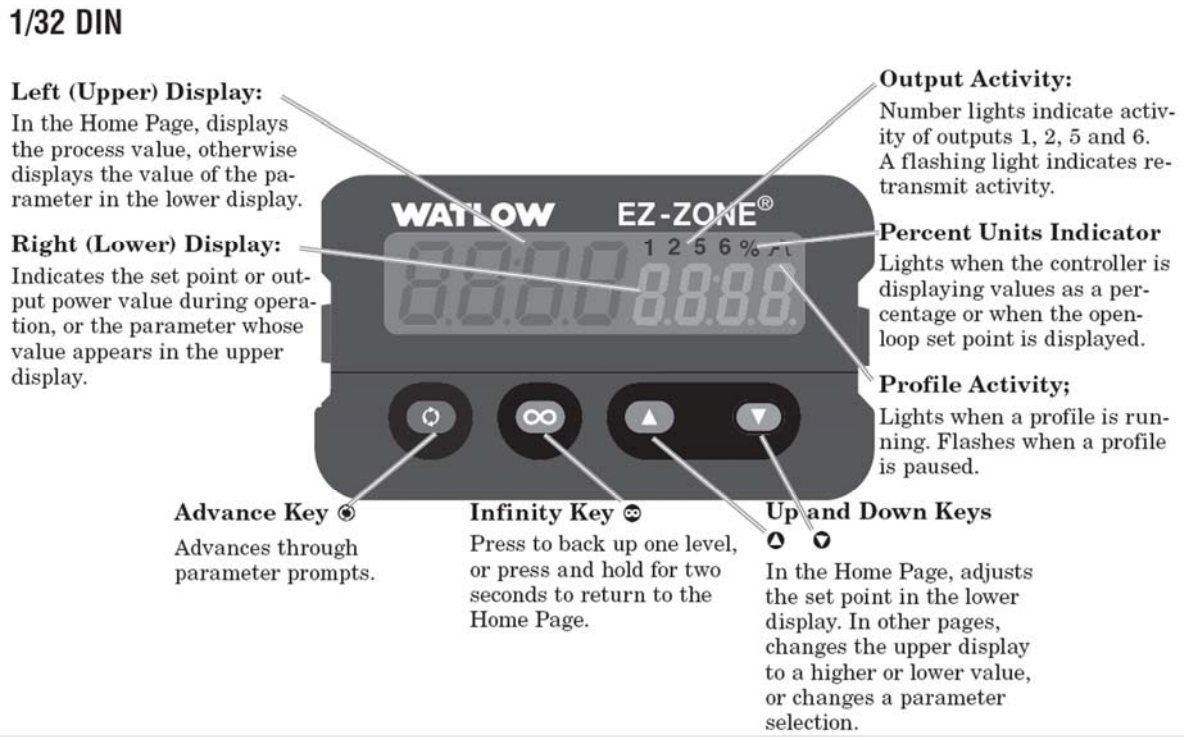
To view, edit and load these programs into the TC-3400 controller the controller must be connected to a computer with **EZ-Zone Configurator** (reference section 7.1**)** software installed.

Note: After installing EZ-Zone configurator create a folder named ***"saved configurations"*** in C:\Program Files\Watlow\EZ-ZONE CONFIGURATOR and copy the contents of the "***canned programs***" located in the TC-3400 CD to this folder.



5.5 Front Panel

For navigating through the various set up and operation pages and menus through TC-3400 controller's front panel please reference EZ-Zone PM User's Manual located on the accompanying CD.



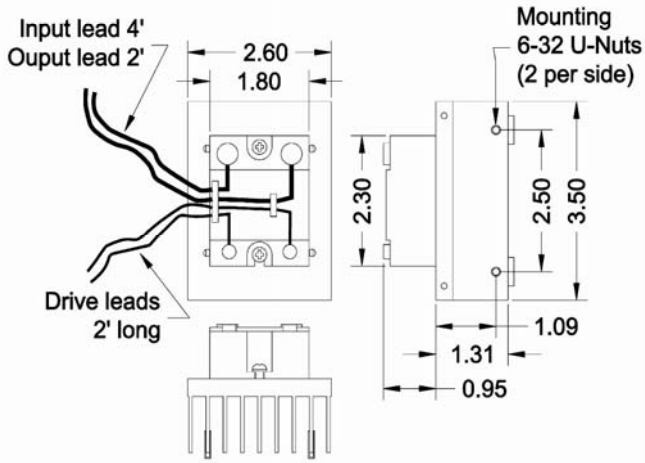
6 EXTERNAL RELAYS (applies only to the models with external relays)

RELAYS

Relays
H-Bridges

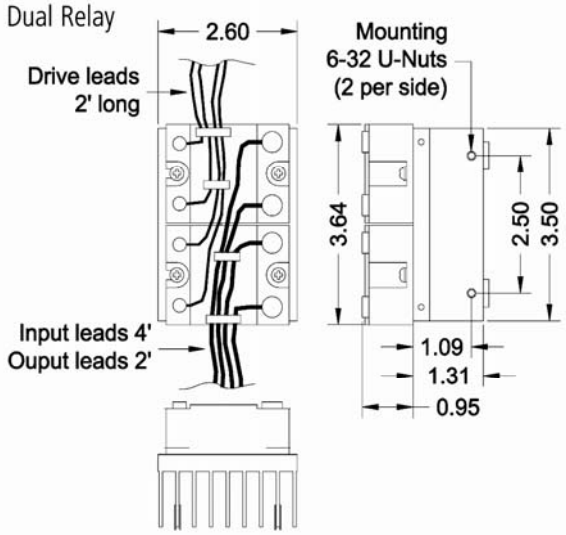
SINGLE RELAY

Single Relay



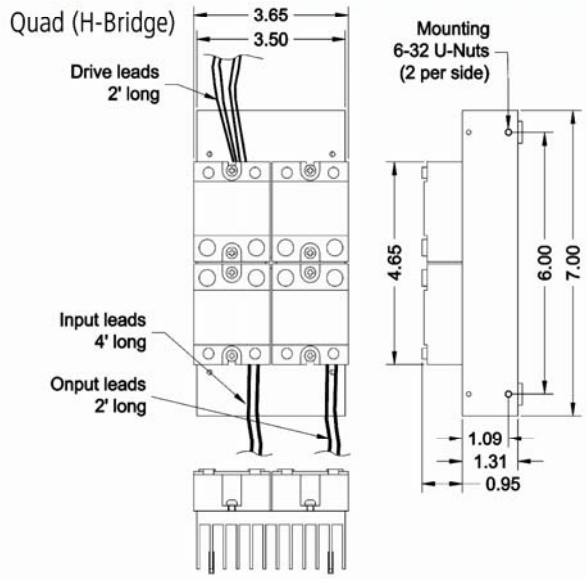
DESCRIPTION	PART #
Cool only, VAC switching, 120/240 VAC, 10 AMPS	RELAY - B
Cool only, VDC switching, 0-100 VDC, 12 AMPS	RELAY - C
Cool only, VDC switching, 0-100 VDC, 20 AMPS	RELAY - D
Cool only, VDC switching, 0-100 VDC, 40 AMPS	RELAY - E

Dual Relay



DESCRIPTION	PART #
Heat/Cool, VDC switching, 0-100 VDC, 12 AMPS	RELAY - F
Heat/Cool, VDC switching, 0-100 VDC, 20 AMPS	RELAY - G
Heat/Cool, VDC switching, 0-100 VDC, 40 AMPS	RELAY - H
Heat/Cool, Heat: 120/240 VAC, 10 AMPS Cool: 0-100 VDC, 12 AMPS	RELAY - I
Heat/Cool, Heat: 120/240 VAC, 10 AMPS Cool: 0-100 VDC, 20 AMPS	RELAY - J
Heat/Cool, Heat: 120/240 VAC, 10 AMPS Cool: 0-100 VDC, 40 AMPS	RELAY - K
Heat/Cool, Heat: 0-100 VDC, 12 AMPS Cool: 120/240 VAC, 10 AMPS	RELAY - L
Heat/Cool, Heat: 0-100 VDC, 20 AMPS Cool: 120/240 VAC, 10 AMPS	RELAY - M
Heat/Cool, Heat: 0-100 VDC, 40 AMPS Cool: 120/240 VAC, 10 AMPS	RELAY - N
Heat/Cool, VAC switching, 120/240 VAC, 10 AMPS	RELAY - R

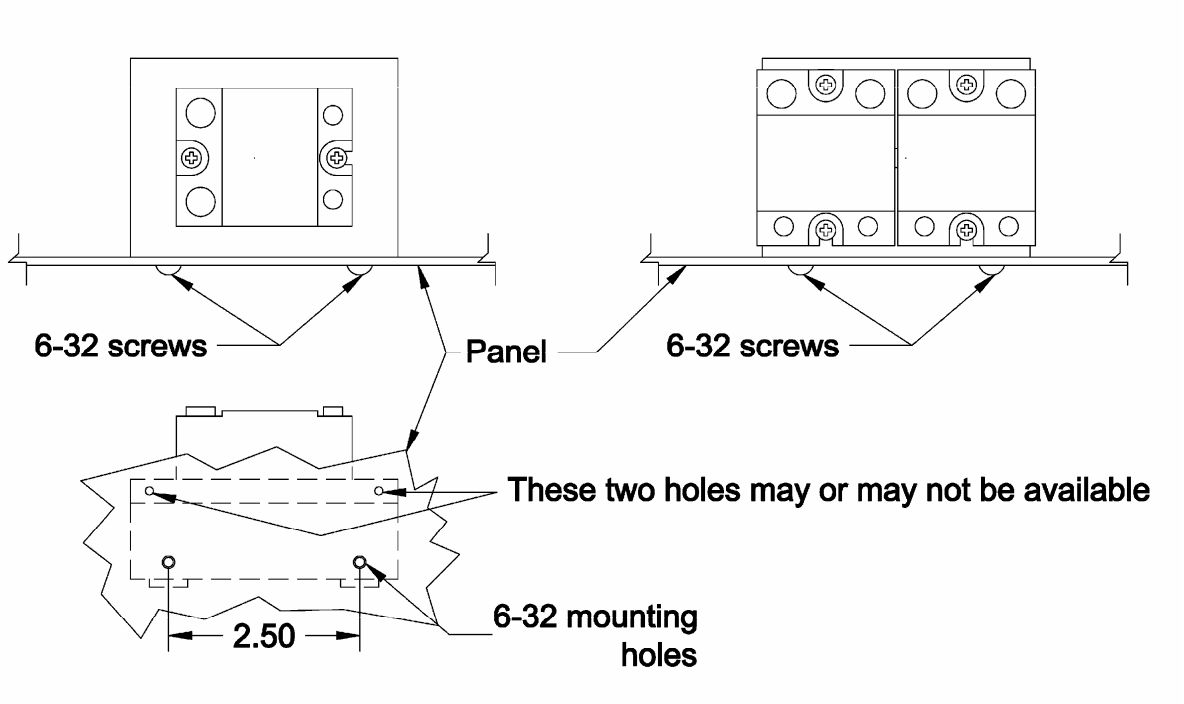
Quad (H-Bridge)



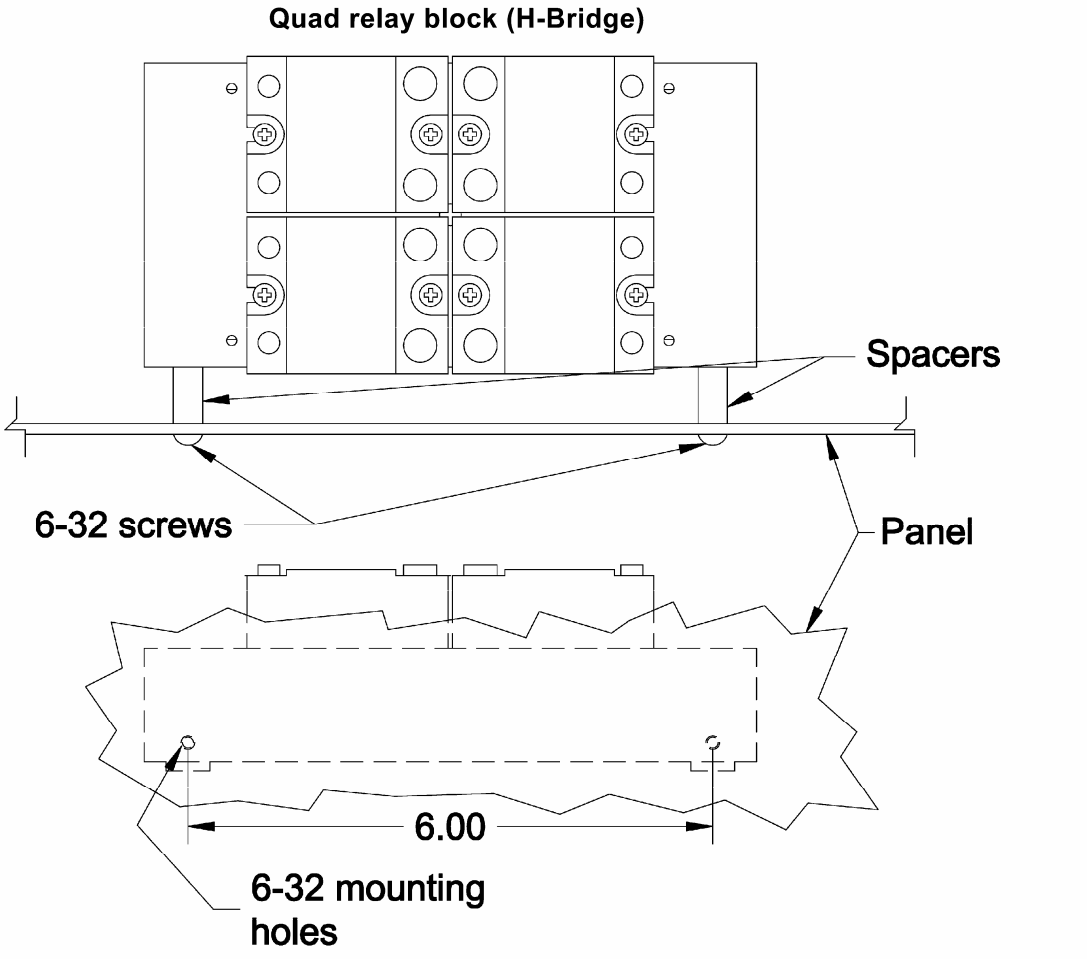
DESCRIPTION	PART #
Heat/Cool, reverse polarity, 0-100 VDC, 12 AMPS	RELAY - O
Heat/Cool, reverse polarity, 0-100 VDC, 20 AMPS	RELAY - P
Heat/Cool, reverse polarity, 0-100 VDC, 40 AMPS	RELAY - Q

6.1 Relay Block Mounting

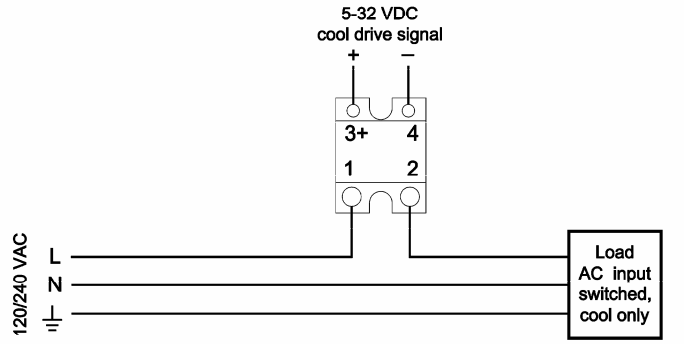
Single and dual relay blocks



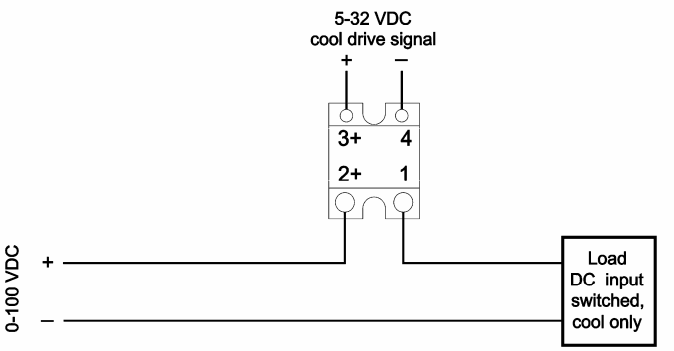
Quad relay block (H-Bridge)



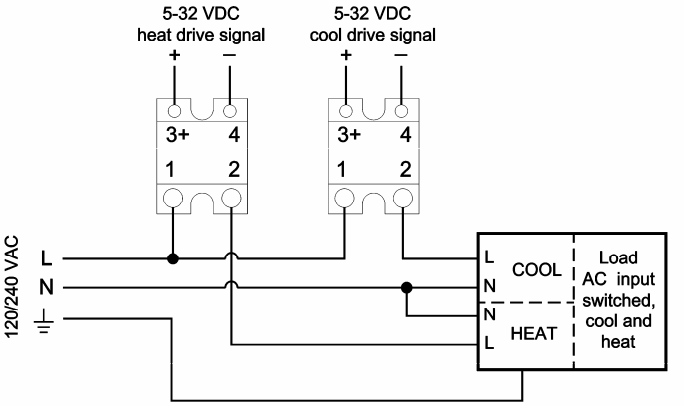
6.2 Relay Block Wiring



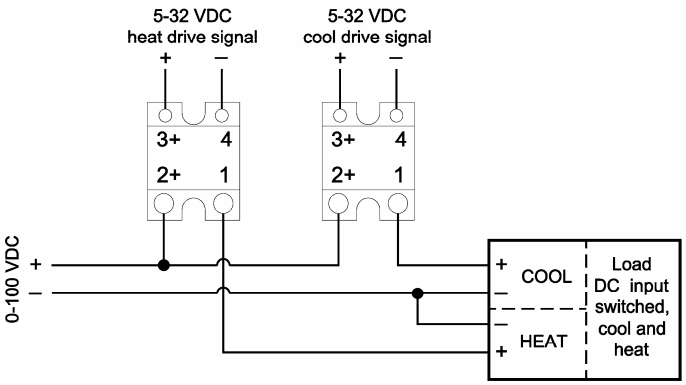
Typical wiring diagram for **RELAY–B**



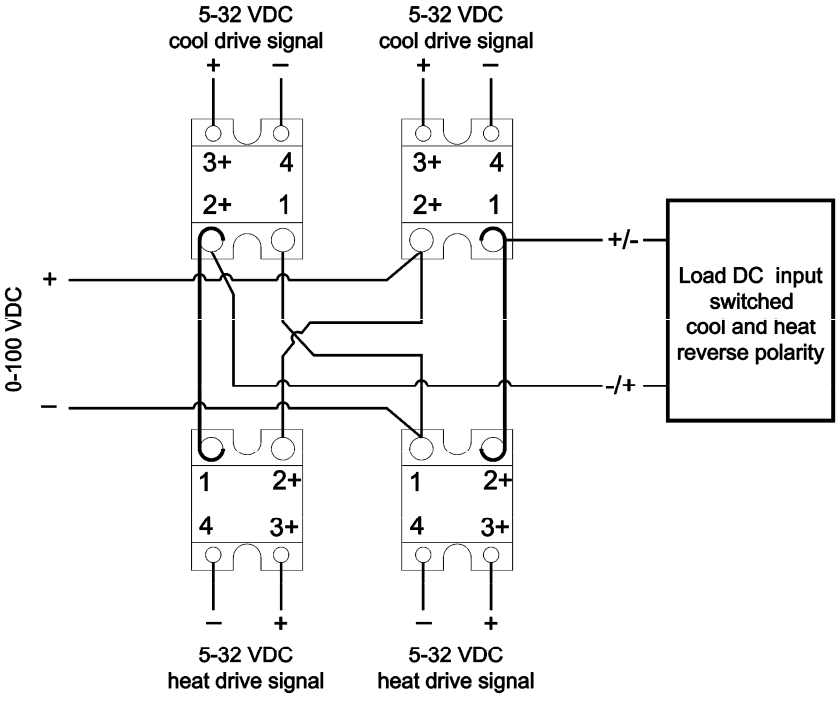
Typical wiring diagram for **RELAY–C, D, E**



Typical wiring diagram for **RELAY–R**



Typical wiring diagram for **RELAY–F, G, H**



Typical wiring diagram for **RELAY–O, P, Q**

7 COMMUNICATIONS

7.1 Standard Bus EIA-485 Communications

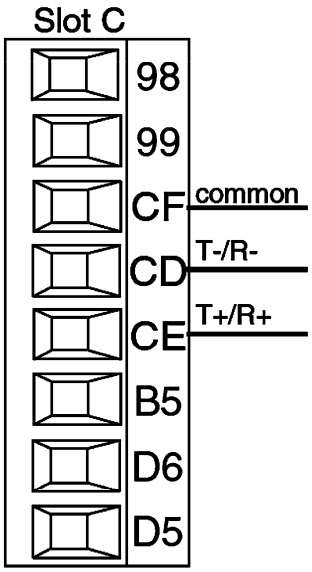
All TC-3400 temperature controllers are equipped with the Standard Bus EIA-485 Communications port. This provides a low level communication between the controller and **EZ-Zone Configurator** (included) or SpecView (optional) programs. The Standard Bus EIA-485 Communication does not work with Modbus RTU protocols or third party software.
For more information please reference included CD.

Note: After installing EZ-Zone configurator create a folder named ***"saved configurations"*** in C:\Program Files\Watlow\EZ-ZONE CONFIGURATOR and copy the contents of the "***canned programs***" located in the TC-3400 CD to this folder.

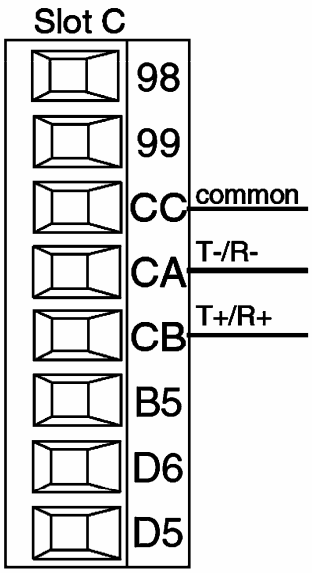
7.2 Modbus RTU or Standard Bus EIA-485 Communications

The controllers equipped with optional EIA-485 Modbus RTU offer wider range of communications and flexibility of working with Modbus protocols, EZ-Zone Configurator and SpecView programs.
For more detail please reference ***TC-3400 comms.pdf*** in the included CD.

Standard Bus EIA-485 Comms



Modbus RTU or EIA-485 Comms



7.3 RS-232 Communication

Same features and benefits as Modbus RTU with the addition of RS-232/RS-485 converter.

7.4 Software

An easy-to-use human machine interface (HMI) solution for providing a cost effective user interface to TC-3400 controller is available for purchase.

For more detailed information please reference **SpecView.PDF** file on the included TC-3400 CD.

8 WARRANTY

LIMITED WARRANTY

In the event a defect in material or workmanship is discovered in any of TECA's products within one year after the date they are delivered to Buyer, and if: (a) TECA is notified of the defect in writing by certified mail within 14 days of the date of discovery; (b) TECA may then either, at its sole discretion, inspect the product at Buyer's location, or require that the product be made available at Buyer's expense at TECA's premises for TECA's inspection within 14 days of the date of notification; and (c) the products are defective and the defects result from faulty materials and/or workmanship and not in any way from accident, misuse, misapplication, mishandling, modification, or alteration by the Buyer or the shipper, then TECA shall, at its sole option, repair or exchange defective products free of charge to Buyer, or credit to buyer the price of the defective products. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, ARE EXCLUDED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL TECA BE LIABLE FOR ANY CLAIM BASED UPON BREACH OF EXPRESS OR IMPLIED WARRANTY OR ANY OTHER DAMAGES WHETHER SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL, LOST PROFITS, BUSINESS INTERRUPTION, OR LOSS OF BUSINESS OR CUSTOMER RELATIONSHIPS.

RETURNED GOODS, RESTOCKING CHARGES

In order to return merchandise for any reason (repair, replacement, or credit) a return authorization number must be issued by TECA. New merchandise may not be returned for credit beyond 60 days from shipment. Charges for incidental or other damages may also be made. All returned goods must be sent freight prepaid. A restocking charge of 15% will apply. On special equipment and custom modified equipment orders, additional incremental cancellation charges may be made.